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FINAL

REQUISITES FOR CONTRACTOR
PRODUCTIVITY IMPROVEMENT

JULY 1981

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ARMY PROCUREMENT RESEARCH OFFICE

U.S. ARMY LOGISTICS MANAGEMENT CENTER
FORT LEE, VIRGINIA 23801

APRO 81-03

FINAL

REQUISITES FOR CONTRACTOR
PRODUCTIVITY IMPROVEMENT

by

Wayne V. Zabel

Monte G. Norton

The pronouns "he," "his," and "him," when used in this publication represent both the masculine and feminine genders unless otherwise specifically stated.

Information and data contained in this document are based on input available at time of preparation. Because the results may be subject to change, this document should not be construed to represent the official position of the US Army Materiel Development and Readiness Command.

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EXECUTIVE SUMMARY

A. BACKGROUND/PROBLEM. In the defense industry, as in the United States economy as a whole, there is an urgent need for improved productivity. Current motivators in defense acquisition policy are inadequate to bring about the desired improvement in today's business environment. Compounding the inadequate motivation is the difficulty in measuring and tracking contractor's productivity gains. The benefits of improved productivity are generally recognized; the problem is how best to do it.

B. STUDY OBJECTIVES. Any study that thoroughly addresses contractor productivity would constitute a major research effort; because of the substantial resource expenditure required for such an undertaking, the Army Procurement Research Office has chosen to do an exploratory study before committing the US Army Development and Readiness Command to a major research project. In this way, the feasibility and estimated costs of any follow-on effort can be determined.

C. STUDY APPROACH. Research began with a review of the literature and current policy regarding productivity. Industry personnel were interviewed to determine their views on productivity and its improvement potential. The sources and kinds of data available to support productivity measurement and reward procedures were determined. Requisites for productivity improvement were developed from this investigation and the feasibility of developing productivity measurement and reward procedures was determined.

D. CONCLUSIONS AND RECOMMENDATIONS. Productivity in the defense industry can and needs to be improved. Declining productivity growth can be traced to: the overall economic climate in the United States; the lack of a coordinated productivity program or goal at the DOD level; ineffective use of various profit and cost related policies which attempt to stimulate capital investment; and lack of a sufficient reward for productivity gains due to difficulty in measurement and tracking of productivity data. It is recommended that support should be given to legislative issues which would contribute to a healthy economy and an atmosphere encouraging investment. The use of special termination buy-back provisions should be expanded, and the policy for implementation of Weighted Guidelines (WGL) should be to insure that warranted profit levels are negotiated. The productivity reward should be removed from WGL and treated under an independent methodology. Since a measurement and reward system appears feasible and practical and has the greatest probability of success as a motivator for improving productivity, an in-depth study should be undertaken to develop such a system. Responsibility for the overall coordination and monitoring of productivity related policies and issues should be assigned at the DOD level.

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CHAPTER I

INTRODUCTION

A. BACKGROUND/PROBLEM.

In the defense industry, as in the United States economy as a whole, there is an urgent need for improved productivity. Should Cost analyses have revealed that significant inefficiencies exist in non-competitive acquisitions. Reports and studies point to the alarming deterioration in the industrial base in general and especially in its readiness to respond to a crisis. The cost of producing weapon systems continues to escalate seemingly out of control.

Improved productivity within the defense industry can be effective in solving many of the problems faced by those responsible for the security of this nation. Even relatively minor productivity improvements will, for example, reduce weapon system production cost and improve industrial base responsiveness. The benefits of improved productivity are generally recognized; the problem is how best to do it.

Competition usually motivates a contractor to improve productivity in competitive acquisitions, but this motivator is absent in non-competitive situations. Therefore, a different mechanism must be established to increase productivity in non-competitive procurements, which amounted to 63.7% of total defense dollars awarded in FY 79. [7] This study focuses on the defense contractor to identify the requisites for productivity improvements in non-competitive acquisitions.

It is well known that under current DOD policy there are disincentives for contractors to voluntarily improve productivity in non-competitive

contracts. Increased productivity reduces the cost base upon which a contractor's profit is calculated for follow-on efforts and hence, reduces his profit opportunity. A substantial investment in facilities capital to improve productivity may not be adequately rewarded (from a contractor's point of view) under current profit policy. Also, with the current criteria for application of productivity rewards, a contractor risks not having his productivity gains recognized.

Although DOD profit policy since 1976 has expressed the desire to motivate and reward a contractor for increased productivity and corresponding cost savings, the policy has clearly been ineffective. [2, 4, 8, 27] To date neither the Army nor Navy has used the productivity reward provided for by the Weighted Guidelines, and the Air Force has had only limited experience. The current motivators are simply inadequate to bring about the desired behavior in today's business environment.

Compounding the problem of inadequate contractor motivation is the difficulty in measuring productivity. A requisite for productivity rewards is the ability to accurately measure and track a contractor's productivity gains. At present, contractor efficiency and productivity cannot be measured without using highly qualified manpower which is not available in the needed quantity. A relatively simple method of measuring productivity and effecting rewards must be developed to reap the benefits of improved productivity.

B. STUDY SCOPE.

These are major challenges facing defense managers. The scope of a study addressing productivity, even one limited to defense contractor productivity, is potentially immense. And any study that thoroughly

addresses contractor productivity would necessarily constitute a major research effort and would probably demand changes in the acquisition process. Therefore, it was decided to first examine the feasibility of such an effort in today's economic and political climate before a large investment was made.

C. STUDY OBJECTIVES.

With this in mind, the objectives of this study were limited to identifying the requisites for improving contractor productivity and to determining the feasibility of developing procedures for motivating and measuring contractor productivity improvements. The requisites regarding DOD policy received primary attention since DOD can effect changes here more readily than in those requisites outside the sphere of DOD control. Recommendations for additional study would be made where it appeared feasible and practicable to do so.

D. STUDY APPROACH.

The study approach to accomplish the above objectives began with a review of the literature and current policy regarding productivity. The current business environment as well as the defense policy a contractor must function under were examined as these areas appeared to offer the greatest potential for substantive improvements. Industry personnel were then interviewed to determine their views on productivity and its improvement potential. Defense personnel involved in the few applications of the productivity reward in the Weighted Guidelines (WGL) were also questioned to learn from that limited experience. Then the sources and kinds of data available to support measurement and reward procedures were determined. From this investigation the requisites for contractor productivity

improvement were identified and the feasibility of developing measurement and reward procedures was determined.

E. REPORT ORGANIZATION.

The remainder of the report presents the results of the study effort introduced in this chapter. Since productivity is a somewhat nebulous term, a brief discussion of productivity is necessary to establish a common understanding. Chapter II discusses the possible definitions of productivity and some associated measurement problems. Chapter III sets the stage for a later discussion of the requisites for contractor productivity improvement by first describing the environment contractors must function in and their recent experiences with productivity related policies. The requisites discussed in Chapter IV are focused primarily on the shortcomings found in current productivity related DOD policy, since DOD policy is more amenable to change than those areas outside DOD control. Chapter V contains recommendations for changes in policies impacting productivity and suggests areas for further research.

CHAPTER II

PRODUCTIVITY CONCEPTS

A. INTRODUCTION.

Productivity is a word that takes on many different meanings to different people. In order to establish a common understanding of the concept of productivity used in this study, a brief discussion of the possible definitions of productivity and associated measurement problems is necessary.

B. PRODUCTIVITY DEFINITIONS.

1. General Definition.

Generally, productivity is the relationship between input of resources and output of goods and services. This relationship can be defined in many ways depending upon the specific need. It is usually expressed as a ratio of a measure of output to a measure of input and is useful in indicating changes over time in the efficiency of an operation.

More broadly productivity can be defined to include effectiveness considerations (i.e., how well the output meets desired program objectives). This concept of productivity involves not only quantity and cost considerations but also quality, timeliness, and responsiveness. In other words, "productivity is concerned with both 'doing things right' and 'doing the right things.'" [20]

The most commonly used expression of productivity, as reported by the Bureau of Labor Statistics (BLS), is output per manhour. This is a rather narrow definition of productivity since only one resource, manhours, is included as input; but it is relatively easy to measure and is useful

as a general productivity indicator.

A more comprehensive definition relates gross output to all associated inputs in a production environment--those of labor, material, and capital. This is the concept of productivity defined by Kendrick and Grossman as total factor productivity (TFP). [17] TFP encompasses all factors of input and output, but it is relatively difficult to measure. All factors must be aggregated in a meaningful way if it is to be useful in understanding the behavior of the activity being measured. Also, the individual factors in the expression can be difficult to measure accurately.

2. Criteria for Contractor Productivity Definition.

There are innumerable other variations on the general definition of productivity as a relationship of input of resources and output of goods and services, depending upon the application and results desired. No one definition is best for all applications. To be useful in encouraging and measuring productivity improvements by a defense contractor, a definition should include consideration of a number of items.

First, the definition should include as many factors of input and output as needed to insure that the measure captures the essence of the activity of concern and represents overall efficiency and effectiveness.

Second, these factors should be quantifiable, if possible, and able to be aggregated into a meaningful expression. This facilitates tracking and comparisons over time with a minimum of subjective interpretation and value judgements.

Third, the definition must be relatable to the defense contract(s) establishing the requirements. There must be a translation or link to the

contracts (past, present or future) so DOD can visualize the productivity improvement and benefit to themselves. This link may take the form of changes in unit price or total cost or some other such measure.

Fourth, the definition should be aligned with the measures used internally by a defense contractor to evaluate his own performance. This is to insure that DOD and the contractor are focusing on the same goals and do not have conflicting standards of performance. Otherwise, DOD's effort to encourage productivity improvements would be futile.

3. Preferred Approach.

Because of the great variety of products and services contracted for and their respective inputs and outputs and the different internal measures of performance used in the defense industry, it is impractical to attempt to present a specific, restrictive definition of contractor productivity. Rather, the general definition of productivity as the relationship between input of resources and output of goods and services is adequate in understanding the concept of productivity used in this study. It is flexible enough to be adapted as appropriate to fit the application at hand. Specific definitions are required and must be developed though, before contractor productivity can actually be measured.

C. PRODUCTIVITY MEASUREMENT.

1. General.

One primary reason the productivity reward portion of the Weighted Guidelines has not been used in the past is the inability of the Government to reliably and consistently measure a contractor's productivity. A requisite for exercising the reward provision is the ability to accurately

measure and track productivity gains. To do this, typically, a productivity definition meeting certain requirements must first be developed. This definition dictates the measurement method and the productivity related information to be collected and analyzed. Each of these areas is loaded with practical pitfalls that will vary from one application to another.

2. Measurement Problems.

Numerous problems present themselves in first defining the contractor's productivity, and then attempting to measure and to aggregate the various factors included in the definition. A single, quantitative expression, which is usually desirable, may not be adequate. Multiple, qualitative expressions may be necessary to describe acceptable performance. Questions arise as to the best way to handle such considerations as inflation, quality changes, and technical improvements. Another issue that must be addressed is where the boundary should be drawn for evaluation and comparison purposes--the cost centers, plant, company or corporation? How should capital, both working and fixed, be assessed and incorporated? And how is all this related to the production contract(s)? These are some of the primary issues facing those attempting to measure contractor productivity. They illustrate the kinds of questions and practical considerations that must be overcome before a productivity measurement and reward system can be implemented.

As of yet there are very few specific answers to these questions, mostly due to a lack of experience and attention. Business executives make productivity related capital investment decisions daily that are based upon the same data and similar concerns expected in a defense productivity

measurement system. The Commerce Department reports that business plans for 1981 investment in new plant and equipment amounting to \$325.7 billion. [32] The expected costs and benefits of these decisions are analyzed similar to the analysis that would be required for a defense contractor productivity measurement system.

3. Available Supporting Data.

Inherent in any attempt to measure contractor productivity is the need for data--data on resource input and data on output. The particular productivity definition decided upon will dictate what the specific data needs are. Generally, data on input resources consumed (i.e., labor, materials, and capital) in terms of dollars will be required for a production contract, as will some aggregate measure of output, often total sales or quantity produced.

It is envisioned that any system developed to measure contractor productivity will rely 100% on the existing data sources. The many data sources and reporting systems currently used by the defense contractor, both internal and external, appear adequate to support a productivity measurement system. The present sources for external reporting contain most of the information needed. These include such reports as Cost Performance Reports (CPR); Cost/Schedule Control Systems Criteria (C/SCSC) reports; DD Form 1861, Contract Capital Employed; DD Form 1921, Cost Data Summary Report; DD Form 1921-1, Functional Cost Hour Report; DD Form 1921-2, Progress Curve Report; DD Form 1921-3, Plant-Wide Data Report; etc. The reporting format may need to be revised slightly to meet the productivity requirements, but the basic data source is unchanged. These external sources should suffice when supplemented where necessary with the

copious data internal to the contractor's operation. Although there remains some question regarding the willingness of a contractor to divulge productivity related information because of its possible sensitivity, generally it does not appear to be a problem.

CHAPTER III

CURRENT PRODUCTIVITY ENVIRONMENT

A. INTRODUCTION.

1. US Industry.

The general decline of US industry is well documented in recent literature. A major concern is the declining productivity growth in manufacturing and its relatively low level compared to other industrialized nations. Figure 3.1 is but one example of why there is cause for concern. It shows that US gains in manufacturing productivity, in terms of output per manhour, have dwindled to 1.6% a year over the period 1973 to 1979. [31] Although the absolute level of US productivity is still higher than other industrialized nations, the gap is closing rapidly and will continue to do so unless the recent trend is reversed. [25]

There are many reasons given for the current situation, including reduced spending for research and development and lackluster investment in capital equipment. There are tremendous benefits to be gained by increased productivity, such as reduced inflation and improved quality of life. The fact remains that US productivity growth needs to be improved if the US is to remain a world power.

2. Defense Industry.

Because of the complicated interrelationships between productivity, cost recovery, return on investment, and general economics, it becomes difficult to trace the root of the particular productivity problem currently being experienced in the defense industry. However, the fact that industry is not running as efficiently as possible cannot be disputed.

(Data: Bureau of Labor Statistics)

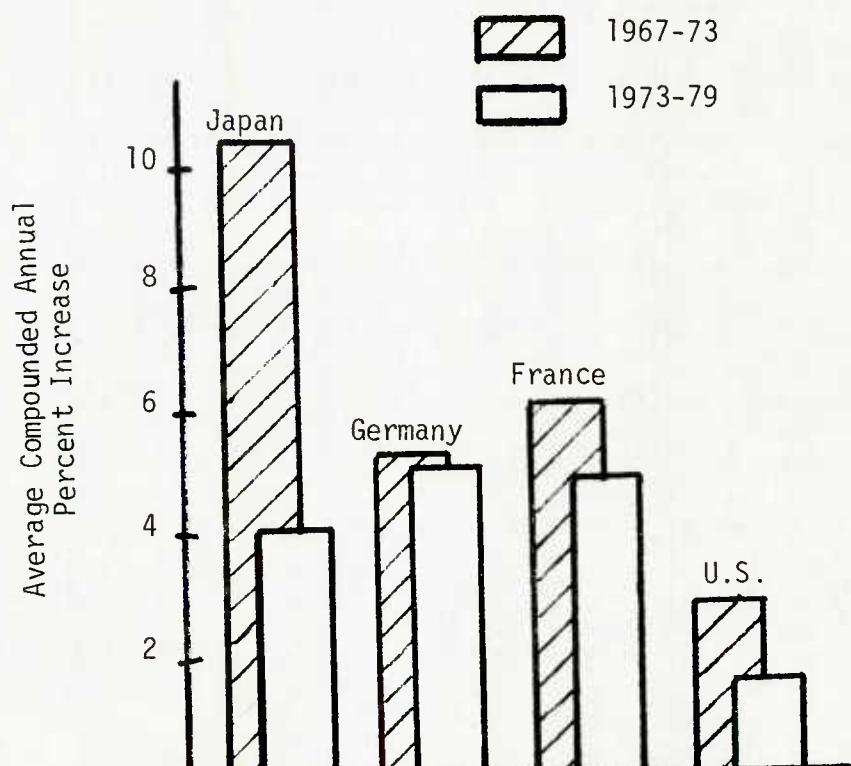


FIGURE 3.1 HOW U.S. PRODUCTIVITY
LAGS IN MANUFACTURING

Not only have there been numerous studies accomplished and panels convened to study productivity and industrial base issues, the Army, as well as the other services, has first hand experience in inefficient practices and cost growth on its defense contracts.

A review of statistics indicates that US Army Materiel Development and Readiness Command activities have performed should cost analyses over the last three years on twenty-five contracts which were proposed at a total price of \$2.5 billion. The final negotiated price amounted to \$2.0 billion. After considering the cost of the study itself and the normal reductions which could be expected as a result of negotiations, a conservative net saving figure of \$120 million could be attributed to the should cost study technique. It must be remembered that these should cost analyses were often performed in an adversarial atmosphere. Additionally, the potential for savings due to productivity enhancing capital investments may be great since this area of inefficiency is not of primary concern to should cost.

Another review of Army should cost studies states that in 44 acquisition contracts since 1975, the difference between the contractor's proposed cost and the negotiated cost was \$691 million, while the cost of performing the studies was only \$7.5 million. [15] Although not all of the cost differences can be attributed to inefficiencies, it does show there is considerable room for improvement in contractor operations. Notwithstanding the magnitude of savings achievable via the should cost technique, current personnel ceilings and the large personnel requirements for should cost limit its application to those acquisitions expected to provide the greatest return on investment.

The need for improved defense productivity is most evident in reviewing DOD's quarterly Selected Acquisition Reports (SAR). The latest SAR Cost Summary (as of December 3, 1981) shows substantial cost growth in DOD major weapon systems.

"The Pentagon reports that inflation, engineering changes, program stretch-outs, etc., added \$47.6 billion to the cost of 47 major weapon programs during the last three months of 1980--reflecting the largest quarterly cost rise on record." [12]

This increase in one quarter brings the new program total estimate for 50 programs to \$310.2 billion. Obviously, productivity improvements alone cannot eliminate cost growth, but they can contribute substantially to reduced cost growth.

Productivity improvements can occur in many ways; but, typically, they involve capital investment and new technology that result in lower unit cost or higher production rate. Studies have shown these two factors together account for over 80% of productivity growth. [1] Labor and other factors account for the remainder. For this reason, most of the past efforts within DOD to improve productivity have focused on incentives for a contractor to invest in new capital equipment and technology.

Prior to analyzing specific DOD policies and other factors influencing industry's productivity investment decisions, it is helpful to visualize the framework of major external influences on defense contractors and their willingness and ability to improve productivity. Figure 3.2 indicates that contractor productivity is influenced by Congress which establishes the broad economic and legal framework of operation; DOD which interprets defense issues and establishes its acquisition policies; and the American workforce which provides all labor. The defense contractor

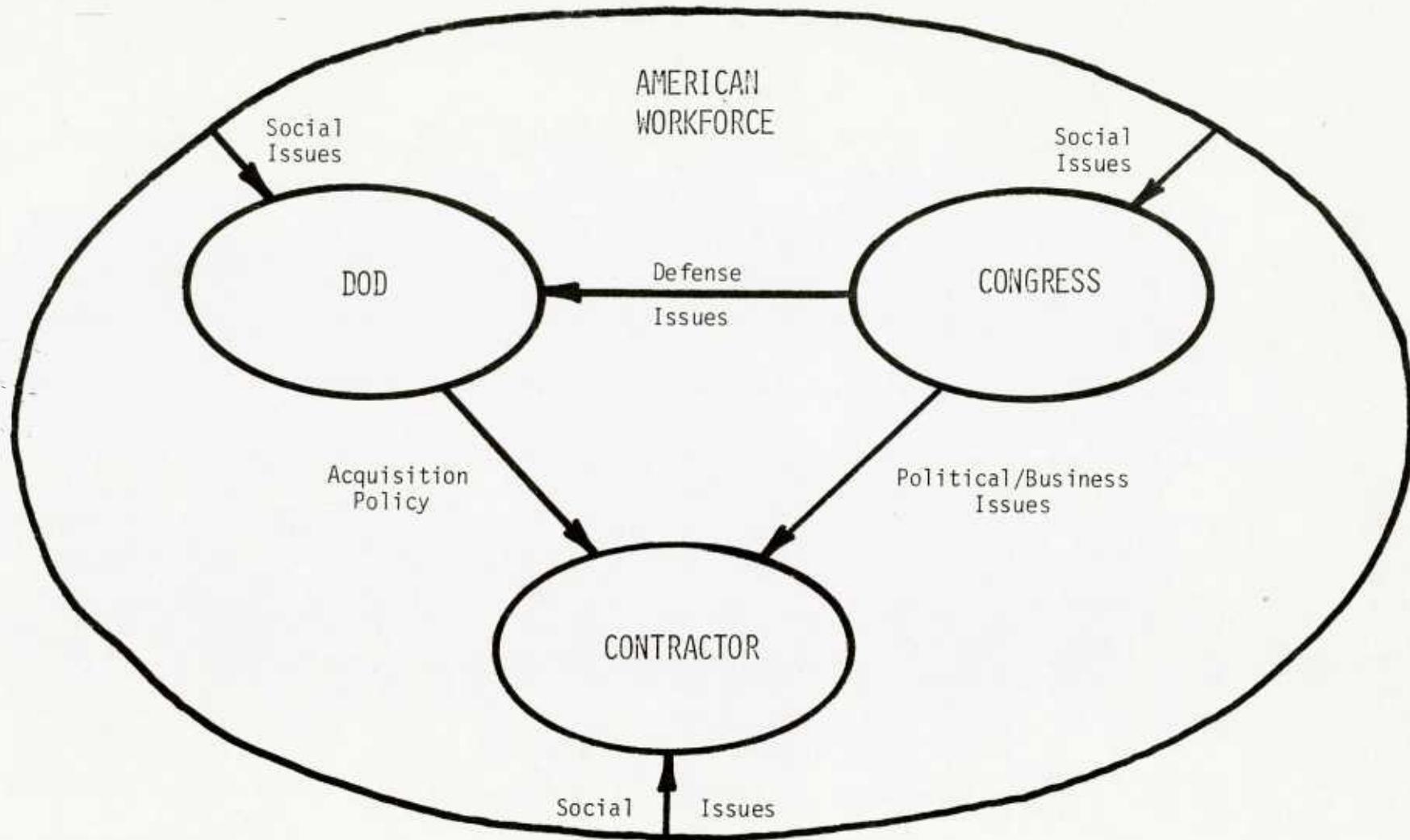


FIGURE 3.2 MAJOR INFLUENCES ON CONTRACTOR PRODUCTIVITY

strives to meet internal goals, including possible productivity improvements, within this framework.

B. PRODUCTIVITY INVESTMENT ISSUES.

1. Economic Motivation.

Corporate managers are expected to produce a prescribed return on assets which the headquarters has allocated to their respective segment of business. The projected rate of return on investment and working capital is one of many hurdles that must be overcome in assessing the merits of proposed productivity investments. An after tax return on investment of 15% is a common goal; however, most managers strive for a 20% return after taxes in order to provide a margin for error.

Industry prefers to think in terms of a return on investment (ROI), usually discounted, rather than profit because the term "profit" does not generally indicate a measure of success. However, DOD requires that negotiations on a proposal for a defense contract center on costs and profit related to the single proposal being negotiated. A profit calculation based on Weighted Guidelines (WGL's) does not take into consideration the taxes that must be paid, nor does it provide for all of the unallowable expenses that are legitimately incurred by industry but not recognized by the Government (e.g., interest expense, cost of operating capital, etc.). It also fails to consider the actual timing of payments which is crucial in cash flow analysis. In other words, a 12% going in profit based on WGL typically translates into a substantially lower realized rate. Therefore, in order for profit to mean more than an initial mark-up, it must refer to the net realized amount after all costs of doing business (including taxes) have been accounted for.

The concept of ROI is central to the decision making process for productivity enhancing investments. If an investment in a commercial endeavor is competing with an investment for a Government program, the program providing the greatest ROI will receive the new investment. In the past the commercial endeavor has usually won.

Financing productivity investments also plays a role in the decision making process. While the actual financing of a given investment becomes academic if the expected ROI does not come up to company standards, funds (or the possibility of raising funds) must be available or the question of any investment itself becomes academic. The availability of funds or the possibility of raising funds is affected by many factors including the general health of the economy, investment funding availability, and depreciation and tax related issues. These elements were discussed in some detail in a recent APRO study of productivity and cost reduction, and their conditions remain relatively unchanged. [35] Essentially, the economy wavers between recovery and recession. Interest rates remain high; inflation rates are high; and personal savings are low because people are satisfying daily requirements in lieu of saving.

2. Social and Political Influences.

Industry continues to be influenced by its social and political environment. Although the Reagan administration has imposed a moratorium on new regulations (except those pertaining to acquisition), business must comply with the existing rulings of the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). Such compliance requires capital investments which have social merit but do not contribute to productivity improvement, and may in fact detract from it.

Additional regulations of the Department of Labor (DOL) and the Small Business Administration (SBA) contribute to an environment where industry is no longer sure that efficient performance and quality products are the most important issues.

On a macro level there appears to be a conflict between the goals of productivity and quality of life. Human and capital assets which could be spent on productive equipment and technologies are often channeled into social improvements such as antipollution activities, safety measures, or centers devoted to the benefit of workers. While some subscribe to the belief that quality of life and worker satisfaction will improve productivity, others hold the converse is true--that increased productivity is the key to improved quality of life since there will ultimately be more for all to share. The goals are, of course, interrelated but appear to conflict in today's environment rather than to complement each other. The impact of their relative priority on the productivity and responsiveness of the industrial base is potentially dramatic as recently stated by Hans Mark, then Secretary of the Air Force.

"The impression was created that we had somehow found a way to pass beyond the crass problems of producing things. We had found a way to pass through the gate to a world in which the 'quality of life' would be enshrined as the highest good, and no entry fee would be required. . . I will argue that the change in outlook is absolutely necessary if we are to continue to play a role in the world as a major power. Professor Amitai Etzioni of Columbia University has put the choice quite simply and correctly. We must either 'reindustrialize' the United States or become what he has called a 'Siesta Society.'" [21]

Although the social and political factors substantially influence a contractor's willingness and ability to improve productivity, these

factors are beyond DOD's control. Therefore, the primary focus of this study is on those DOD policies that are thought to impact a contractor's productivity. Such DOD policies include: the profit policy, cost of capital, capital investment incentives, multiyear contracting, value engineering, and manufacturing technology.

3. DOD Acquisition Policy and Practices.

a. DOD Policies.

(1) General. DOD does not currently have a single coordinated program for productivity improvement in its acquisition regulations. In noncompetitive acquisitions an attempt is made to motivate productivity via policies related to cost recovery and profit. DAR 3-808.1(a) states:

"It is the policy of the Department of Defense to utilize profit to stimulate efficient contract performance. Profit generally is the basic motive of business enterprise. The Government and defense contractors should be concerned with harnessing this motive to work for more effective and economical contract performance."

The purpose of this section therefore is to review the stated profit policy, cost principles, and risk related policies that are designed to induce productivity improvement.

(2) Weighted Guidelines (WGL). The WGL technique of profit determination is a structured approach used to consider the relative value of several profit determinants and establish a basis for a profit objective. The four major profit parts or areas within WGL are Contractor Effort, Contractor Risk, Facilities Investment, and Special Factors. Although the DD Form 1547, Weighted Guidelines Profit/Fee Objectives, 1 Jan 80, is used for documenting a profit objective, several additional forms provide input necessary to the completion of the DD 1547 itself. These

additional forms which have been developed to implement policies related to capital investment will be addressed in the following paragraphs.

(a) Part I, Contractor Effort. This initial part of WGL provides a basis for profit related to those direct and indirect costs the contractor incurs in fulfilling the contract requirements. Included are such costs as material acquisition (subcontracted items or purchased parts), engineering and manufacturing labor and their respective overheads, and general and administrative expenses. The profit total for contractor effort is reduced by 30% to offset the cost increases attributed to the imputed cost of facilities capital.

(b) Part II, Contractor Risk. This part of WGL provides profit based on a relationship between the total contractor effort and the type of contract to be awarded. A cost type contract would earn substantially lower profit in this part (0-0.5% weight range) than a more risky firm fixed price contract of the same dollar value (5-7% weight range).

(c) Part III, Facilities Investment. This part was added to WGL as a result of the Profit '76 study. Profit earned in this area is related to the investment risk associated with the facilities employed by the contractor. Sixteen to twenty percent of the net book value of facilities capital allocated to the contract is the normal range of weight used in this area. The contractor is required to complete a form CASB-CMF, Cost of Money Factors Computation, which is used to develop factors for allocation of facilities capital. The actual allocation takes place on a DD Form 1861, Contract Facilities Capital and Cost of Money, 1 Sep 76. The output of this form is both the imputed cost of money and the facilities capital employed on the contract. The facilities capital

employed becomes the basis for some amount of profit depending on risk, age of facilities, undepreciated value of facilities, etc.

(d) Part IV, Special Factors. This part of WGL provides an opportunity to earn additional profit for contractor achievement in the areas of productivity and independent development. The "productivity reward" in this section was developed to provide contractors a reward for their lost profit opportunity on follow-on contracts as they become more productive and reduce contract costs. The contractor may also gain or lose up to five percent of the basic profit objective in a separate section of this part entitled "other factors." This relates to contractor participation in various social and economic programs tagged onto the acquisition process. Such programs include small and small disadvantaged business participation, labor area surplus participation, and energy conservation.

(3) Cost of Capital. Effective 1 Oct 1976, DOD recognized the cost of capital committed to facilities as an element of contract cost. This recognition took the form of a cost accounting standard, specifically CAS 414. This standard, and the CASB-CMF form used in its implementation, does not consider operating or working capital; rather, it provides an accounting treatment to develop an imputed cost which is determined by applying a cost of money rate to facilities capital. The cost of money rate is based on interest rates determined by the Secretary of the Treasury, pursuant to Pub. L. 92-41 (85 Stat. 97). The standard provides that a facilities cost of money factor shall be determined for each indirect cost pool to which facilities capital has been allocated and which is used to allocate indirect costs to final cost objectives. The CAS 414 cost is not to be confused with the actual capital employed for

WGL purposes even though they are both calculated on the DD Form 1861. The capital employed is one basis for profit determination, while the CAS 414 cost is an imputed cost paid to the contractor but not considered in profit determination.

(4) Capital Investment Incentives (CII). The use of special provisions designed to transfer to the Government some of the risk associated with acquisition of certain capital assets by a contractor is one of the latest policies designed to stimulate investment. This policy is designed to provide [✓] special termination protection to contractors that would not ordinarily invest in the necessary facilities because of excessive risk. When this approach is deemed necessary, a specially tailored clause is negotiated into the contract. The clause becomes effective in the event that the contract or program is terminated or funds are not provided in subsequent fiscal years. The clause may require the Government to acquire specific capital investments at no more than their depreciated value. This technique is more commonly referred to as "special termination buy-back provisions." As the expression implies, the Government will buy the covered facilities from the contractor upon termination thus reducing the risk of program uncertainty to the contractor.

(5) Multiyear Contracting. Multiyear contracting is a method of acquisition whereby a contract is awarded for known requirements for up to five years in support of programs reflected in the DOD Five-Year Defense Program. The contractor is protected against loss resulting from cancellation by contract provisions recognizing the allowability of reimbursement of unrecovered nonrecurring costs included in the prices of the cancelled items. The multiyear contract may authorize the contractor to

incur costs for materials, tooling and labor applied to the total quantity of end items rather than limiting costs to only those items ordered and funded in a single year. With this "guarantee" of a long-term production contract, the contractor has a greater incentive to invest in innovative manufacturing techniques and efficient capital equipment.

(6) Value Engineering (VE). Value engineering is a formal method whereby contractors may suggest changes to a specific contract which would reduce the overall cost to the Government. Engineering techniques are utilized to determine nonessential functions or components which contribute to the acquisition, operational or logistical support costs of end items or tasks. Under this technique, the contractor shares the savings after all development, implementation, and any cost increases are deducted from the gross savings.

(7) Manufacturing Technology (MT). The Army's MT program is an organized approach designed to increase productivity through development and use of the latest manufacturing technology concepts and principles. Although originally designed to manage the transition from hand crafted development models to low rate initial production of all Army commodities, program emphasis is currently directed to end item development. MT is used to develop and implement manufacturing processes that emphasize energy efficiency, pollution abatement, and computer control. The projects are directed primarily to specific items and only secondarily to more generic applications. This is a government funded program with projects being conducted in both government laboratories and private industry. [3] Other services have similar programs addressing manufacturing technology, such as the MANTECH program in the Air Force.

b. Implementation and Impact of DOD Policies.

(1) General. Since there is no single coordinated DOD program for productivity improvement, managers within acquisition activities must strive to stimulate productivity improvements within individual contractual instruments. The various policies relating to profit and cost recovery have evolved over a period of time and have been "fine tuned" in an attempt to provide mechanisms for motivating contractor investment and productivity. However, the various policies are not interdependent, and have generally been ineffective in stimulating investment because of shortcomings in their structure or implementation or both. This section will address each of the policies from the standpoint of implementation and impact.

(2) Weighted Guidelines (WGL). DOD considers profit to be the motivator for efficiency, and its WGL structured approach to developing a profit objective is the most sophisticated profit methodology used in any of the executive departments. Yet, studies and interviews with many knowledgeable individuals in the acquisition arena point to several aspects of the WGL which cause the methodology to be ineffective as a motivator.

The single biggest deficiency in WGL lies in its actual implementation. Contractors are convinced that they can expect a very small range of possible profit, and no matter how the profit is allocated between the four parts of the DD Form 1547 that total profit range is rather fixed. One recent study which looked at Army negotiated contracts for fiscal year 1977 through 1979 drew the following conclusions:

(a) the intent of the policy is not being adhered to in view of the narrow range of weights being used within the various parts of the DD Form 1547 although the policy allows for a much broader weight range,

(b) profit becomes a predictable function of the contractor's proposed cost,

(c) contract type (risk) is the greatest profit determinant,

(d) there appears to exist a target for profit as a percent of cost which tends to prevent the intent of the profit policy from being realized. [18]

Contractors also argue that WGL does not take into consideration the large amount of effort they must expend in the management of subcontracting on large system contracts. In today's environment, the management of subcontracting may be the biggest problem area to a prime contractor having overall responsibility for a system, yet the low weight range for material acquisition does not provide flexibility to adequately reward the prime for its efforts.

The productivity reward in the special factors area was added to WGL in an attempt to provide a mechanism for compensation of lost profit opportunity because of productivity improvements on earlier contracts. Unfortunately, the Navy and Army have never used this special factor. One division of the Air Force attempted to use a productivity reward on a limited number of acquisitions; however, interviews with the contracting officers and pricing personnel at that command indicated that they were not pleased with the results. The contractors submitted data

at the prodding of the contracting officers and productivity rewards were given, yet the Air Force personnel agreed that the data reflected little more than learning curve experiences and even so, the reward was not really worth the effort. All but one of the contractors involved have indicated they will not request productivity rewards on future acquisitions. The problem in the productivity reward areas seems to be:

- (a) measurement is difficult,
- (b) tracking of cost is difficult, and
- (c) the amount of reward offered in the policy is insufficient to motivate any large scale effort.

(3) Cost of Capital. There are several aspects of CAS 414 which impact on its value as a motivator for capital investment. One ✓ drawback to CAS 414 is the use of treasury rates which tend to underestimate the true cost of funds invested in capital. The bi-annual rates lag an upward trend in interest rates and lead a downward trend; therefore they are consistently less than the actual rate contractors pay or lose as a lost opportunity cost. The Cost Accounting Standards Board (CASB) recognized this problem when they stipulated the use of such rates in the promulgation of CAS 414; however, the use of actual rates would undoubtedly cause serious problems in the implementation and administration of this standard.

✓ Another impediment to the success of CAS 414 is the offset feature which was worked into WGL. The effect of the offset is the reduction of profit dollars to compensate for increases in cost dollars with no net real gain in returns to the contractor.

✓ The cost of operating capital is specifically excluded

in CAS 414, and is not recognized as an allowable cost by DOD. The CASB noted its intentional absence in CAS 414 and stated that they were not prepared to make determinations on all issues of operating capital at that time. The board also stated their intention to seek to resolve the operating capital problems, but the board itself no longer exists and the issue was never resolved. Since operating capital costs are not allowable, contractors experience cash flow problems which further complicate their profit picture and return on investment.

(4) Capital Investment Incentives (CII). The special termination buy back provisions of CII have been successfully used on a variety of major systems including the Fighting Vehicle System (FVS), XM1 tank, B1 bomber, GAU8 gun of the A10 aircraft, and the F16 aircraft. In each case the contractor acquired new capital equipment only because of the special incentives. The risk in each of these programs was so great that the contractors would not be able to make the large expenditures of corporate funds for capital without the guarantees afforded by the special clauses for CII.

The termination of the B1 bomber program is the only instance to date where a contractor had to invoke the clause. Even in the case of the complete termination of the B1 program, the contractor was able to utilize or sell most of the equipment protected by the clause, and the cost to the Government was only a small percentage of the original contingent liability.

In view of the success of the special termination buy back provisions, it is surprising that its application has been so limited. Even though the concept is restricted to major weapon systems acquisitions,

greater use could be made by all services. The limited use appears to stem from a lack of understanding and unfamiliarity on the part of acquisition personnel.

(5) Multiyear Contracting. Among the many conclusions drawn by the Committee on Armed Services, House of Representatives, ninety-sixth Congress was a finding that:

"Existing restrictions on advanced procurement, multiyear contracting, including restrictions on the extent and content of cancellation ceilings, and funding of defense contracts, are unrealistic in view of the economic realities that now prevail on the defense industrial base; . . ." [30]

The five million dollar cancellation ceiling has been held by many to be the single largest impediment within multiyear to investment in new capital for productivity improvement. The additional restrictions of the non-recurring content of the cancellation ceiling and problems associated with the full funding concept and annual appropriations stymie economic quantity purchases of materiel. In short, the objectives of multiyear contracting cannot be met due to the current restrictions placed on the acquisition method.

Bills are currently before the House and Senate and the outcome for multiyear is unsure. However, efforts are underway to raise the cancellation ceiling to either \$50 or \$100 million, include recurring costs in the cancellation ceiling, and provide relief to the full funding concept. In the event these changes are incorporated into the law, multiyear will become a major factor in productivity in that it will provide a substantial reduction of program risk and a more realistic basis upon which contractors will be able to make investment decisions.

(6) Value Engineering (VE). The only application of VE as a technique for capital investment motivation was found in the Army's ROLAND project. Since the ROLAND project entails changing from European to American technology and processes, the contractor has been able to submit seventeen VE change proposals (VECP's). As long as the regulations stipulate that a change to the contract is required to implement a VECP, manufacturing process changes will not generally qualify for VE sharing. Since a contractor retains all the savings for a process (non-contractually specified) change, it would appear that he is highly motivated. However, if new equipment is required to implement the process change or new technology, the contractor finds himself facing the ROI problem. There are currently no provisions in VE for assisting contractors in the area of capital equipment; therefore, the VE program has had virtually no impact on productivity investment.

(7) Manufacturing Technology (MT). The success of the MT program is evidenced by the estimate of \$530 million of peacetime savings over the next five years from Army MT projects already completed. [3] Increases in the modest funding of MT combined with publicity aimed at technology transfer and spinoffs would influence positively the MT program results.

"The Defense Science Board Task Force estimated that a 5 to 1 payback would result from a properly implemented MANTECH effort with industry." [30]

An increase in MT funding to 1% of each services' annual procurement budget was recommended by the Defense Science Board 1980 Summer Study Panel on Industry Responsiveness. [28] The individual services are taking measures to improve the documentation of first and additional implementations of MT improvements as well as dissemination of MT program achievements.

CHAPTER IV

REQUISITES FOR CONTRACTOR PRODUCTIVITY IMPROVEMENT

A. INTRODUCTION.

Before addressing the specific requisites for productivity improvements in the defense industry, it is useful to first visualize where the potential exists for improvements and where the initiatives for change must originate. Figure 4.1 depicts the potential for contractor productivity improvement as an iceberg. The iceberg illustrates the primary influences on defense productivity and shows that initiatives to improve it must come not only from DOD and Congress but also eventually from the American workforce.

The tip of the iceberg is that portion addressed by DOD policy and is indirectly controllable through policy changes to encourage productivity improvements. These include, for example, such initiatives as multiyear procurements, expeditious progress payments, buy-back provisions, and profit policy. But as with all icebergs, the tip comprises only a small percentage of the total body. The vast majority of the potential lies submerged, beyond the control of DOD policy makers, in the environment that the defense industry must function in.

Part of this environment is defined by Congress, and only they can initiate the actions necessary to bring about productivity improvements.

- ✓ For example, tax laws permitting rapid depreciation will encourage investment in productivity enhancing equipment. Regulations and controls on business activity in general can be relaxed in some areas permitting more

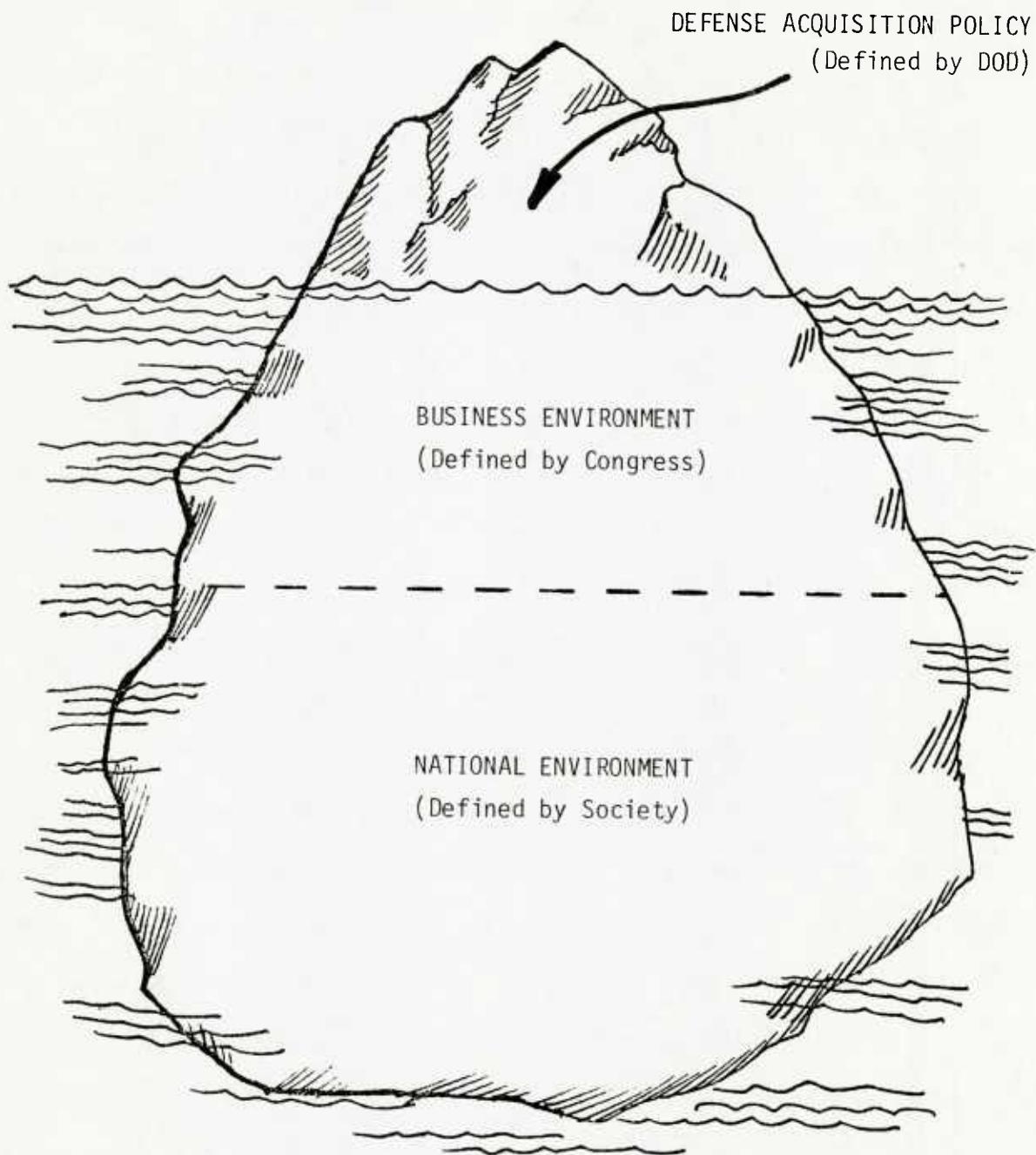


FIGURE 4.1 POTENTIAL FOR CONTRACTOR PRODUCTIVITY IMPROVEMENT

efficient operations. And only Congress can change the social programs currently encumbering the acquisition process which result in less efficient procurements, both from an administrative and production standpoint.

Congress can influence defense productivity improvements to a far greater degree than DOD policy, but perhaps the most influential of all is the national environment and what is generally described as the American work ethic. Significant contributions to productivity growth in the defense industry can be made by simply doing a better job. No magic is required--just better management, better engineering, and better labor. The defense industry has not escaped the national attitude that affects the American workforce in general. If long-term progress is to be expected, workforce attitude and behavior must be addressed; and although it is beyond the scope of this report, workforce attitude and behavior should be recognized as a major, if not primary, source of productivity improvement.

B. REQUISITES IN THE BUSINESS ENVIRONMENT.

Although only Congress can directly bring about defense productivity improvements through changes in the general business environment, DOD should voice the need and support such legislative initiatives where possible. The primary goal is to establish a business environment that is conducive to productivity growth. Initiatives can be taken in a number of areas to help establish the proper environment. Some are already underway.

1. Tax Policy.

Tax laws that encourage research and development and capital investment are essential to reindustrialize U.S. business. Specifically, more rapid depreciation allowances are needed that result in more efficient plants and equipment. This investment, along with the new technology in

areas like robotics and cybernetics, can revolutionize the way the US does business.

2. Relaxed Regulation.

Regulations that require investments in areas other than productivity enhancements have placed a large burden on business. Although improvements are needed in these areas, the standards established or degree of improvements required should be viewed in terms of impact on productivity. Investments in pollution abatement equipment, noise reduction systems, and occupational safety programs, for example, use funds that could otherwise be used to improve productivity.

Additionally, regulations requiring detailed reports where federal funds are involved add an administrative burden that detracts from business productivity. These too should be viewed in terms of their impact on productivity.

3. Allowable Profit.

Congressional standards of allowable profit, especially for defense contractors, should be adjusted to match the economic realities of today's business. Profit, or specifically return on assets employed, is at the heart of capitalism. If profits are limited by taxes or any other mechanism, voluntary investments are likewise limited. Industry will only take the necessary risks of productivity investments if the expected rewards warrant it.

4. Socioeconomic Programs.

The Government has a responsibility to all citizens for their security and general welfare. The degree of that responsibility is an often debated issue and will not be addressed here, other than to state the impact of past decisions on the current defense acquisition process.

The defense budget continues to be used as a vehicle to promote many socio-economic programs such as small business interests and equal employment opportunities. These programs have encumbered the acquisition process and detracted from both Government and contractor productivity. These costs should be recognized when considering the implementation of new programs.

5. Political Behavior.

These example requisites in the business environment, if met, will bring about improvements in defense as well as national productivity; but, more importantly, what appears to be needed for long-term productivity improvement is an attitude and behavior change in Government and business leaders alike. Productivity growth must be viewed as a national goal of sorts, and the impact on productivity of proposed policy changes must be considered before implementation.

In explaining Japan's economic success, Peter Drucker offers a set of rules or ideals for managing a pluralist society. He credits Japan's competitive success to a difference in philosophy or political behavior rather than the popular concept of Japan as a superconglomorate (i.e., Japan, Inc.). He argues:

"Contrary to popular belief in the miracle of Japan, Inc., the competitive success of Japanese industry is not the result of some uniformity of thought and action. It is the result of something far more interesting--habits of political behavior that use the diversity in Japanese national life to produce effective economic action. One of these habits is to consider thoroughly a proposed policy's impact on the productivity of Japanese industry, on Japan's competitive strength in the world market, and on Japan's balance of payments and trade. This has become almost second nature for Japanese policymakers in the ministries, in the Diet, and in business as well as for analysts and

critics in the popular newspapers and university economics departments." [10]

In addition to the habit of taking competition seriously, the policymakers must also consider the national interest before self interest (to a degree); make external relations important (which involves mutual understanding of participants); and not seek final victory over opponents with which one still has to live. Of course, it is not known for certain whether this particular approach will work in the US, but it represents the kind of attitude and behavior change necessary if government and business leaders are serious in their attempt to make long-term improvements in productivity.

C. DEFENSE ACQUISITION POLICY REQUISITES.

1. General.

Although many of the factors contributing to poor productivity in defense business are common to all business in the US and are beyond the control of DOD, there are actions that can be taken to directly impact productivity on defense contracts. Such actions fall into the following two categories:

a. Steps must be taken by Congress and DOD to provide a sense of stability in the defense market. An atmosphere must be established where contractors will be able to evaluate the long-term merits of actions they have to take to improve their productivity.

b. DOD must also take action to insure that adequate rewards are available for productivity improvements. This cannot be accomplished by reliance on a number of disjointed policies or initiatives. Productivity should be recognized as a major problem area; and, accordingly, it should be dealt with under a systematic, coordinated program.

2. Stability in the Defense Market.

Sophisticated marketing techniques are used by industry to predict their sales potential for the long run. Such forecasts and knowledge of market stability provide a basis for decisions on optimum utilization of resources. Commercial endeavors are amenable to analysis via marketing techniques, whereas the defense market reflects certain peculiarities which cause sales predictions to be extremely risky. The budget formulation and execution process, the practice of buying one year's requirement at a time, and the threat of termination or slow down of a defense program contribute to market instability and increased risk in the allocation of resources. Improvements to the multiyear acquisition technique and expanded use of special termination buy-back provisions will contribute to a much needed sense of stability in defense acquisition. Any contractor who knows the market potential for his product will be in a better position to assess the return on investment than the contractor that sees only one year's requirement at a time. Stability alone, however, is not the answer. Action is required to make the return on investment attractive enough to warrant contractor action.

3. Profit Policy and Return on Investment.

WGL, being cost based and tied to a single contract, is an easy and convenient methodology for achieving a profit objective. However, the current DOD profit policy, and especially its implementation, has failed to provide either the incentives for which it was designed, or the ROI a contractor requires. [2, 4, 8, 27]

Studies indicate that the range of profit as a percent of cost is narrow and predictable. Contractors know that an increase in profit in

Industry ROI
DDO WGL profit

p 16

Concept of ROI is central to decisionmaking^{p 17}
process for productivity enhancing evalult

Weighted Guidelines p 19-21

Cost of Capital p 21

Capital Investment Incentives p 22 Special Termination Provisions

Value Engineering (VE) p 23

Impact of DOD Policies

WGL p 24

Cost of Capital CAS 414 p 26
offset

Capital Investment Incentives - Termination Provisions p 27

Value Engineering p 29

Mfg Tech p 29

Bibliography for Contractor Productivity Improvement p 33

one area of WGL will be offset by decreases in other areas in order to keep the total percent of profit in the "acceptable" range. Shifts of profit levels within WGL has compensated for profit on capital employed, and the offset on contractor input has compensated for CAS 414 costs. The rationale that a cost reduction resulting from a productivity improvement will be rewarded on a follow-on contract via a productivity reward is good except that the special factor for productivity is not being used. The intent of the profit policy is not being met by current WGL implementation. A profit policy based on return on investment would be the most ideal method for stimulating productivity investments; however, if WGL is to continue as the mechanism for implementation of DOD profit policy, the following two changes would be appropriate:

a. Some action complimenting the DAR, such as a policy statement signed at the Defense Undersecretary level, should be taken to insure that contractors are given a fair and reasonable profit rather than a percent of profit the buying office can live with.

b. The productivity reward should be taken out of special factors and treated under an independent methodology, since investments and returns for productivity tend to be long run and normally transcend the immediate profit negotiation.

4. Productivity Measurement and Reward System.

Although a productivity program and measurement technique would have to be designed and a reward system structured regardless of whether the productivity reward is removed from WGL, such a program could operate for productivity much as the VE program operates for engineering changes. At first glance this could appear to be a radical concept; however, it is

very similar to the TECHMOD program instituted by the Air Force (AF) at the F16 plant in Fort Worth, Texas.

General Dynamics (GD) has a production contract for the F16 aircraft, and they also have a significant ongoing productivity program involving both AF and GD funding. The contractor has a level of effort requirement for conducting a productivity review with an award fee feature for productivity program management. The proposed productivity improvements, which include process improvements and capital equipment investments covered by special termination buy-back provisions, are funded by the contractor. The proposed cost reductions are reflected in reduced target costs on the fixed price incentive annual production buy, and the actual savings are shared by the AF and GD based on a return on investment model. The details of this TECHMOD program were negotiated in a "business agreement" prior to incurrence of cost. This program has appeared to yield a 15% productivity improvement and \$350 million cost avoidance. Since the TECHMOD technique utilizes Government funding in the level of effort review, it is currently confined to major systems. A productivity improvement program could be designed with a variation of the funding and be applied to all negotiated acquisitions greater than some minimal dollar value.

5. Coordinated Program.

Notwithstanding the seriousness of the productivity crisis in the US and the media attention drawn to it, there is no national goal or coordinated program for productivity improvement. Likewise, there is no goal or coordinated program at the DOD level to improve productivity on defense contracts. Past efforts to stimulate productivity in defense

contracts have consisted mostly of minor modification of various existing policies which were not originally designed to address productivity. This lack of a systematic approach to productivity has resulted in an atmosphere where the average defense contractor must look to the tax laws, the Weighted Guidelines (WGL) based profit, and other cost accounting treatments to seek a return on his resources employed to achieve a productivity improvement.

In view of past overregulation abuses, concern over the size of Government and the current austere environment, a large bureaucracy organized for the sole purpose of developing and coordinating productivity policy is not an acceptable option. However, responsibility should be assigned at some level within DOD to assure that the various policies impacting productivity complement each other and mesh into a single program for productivity. Such a DOD focal point could also serve the function of communicating DOD positions on productivity issues to Congress, other Federal Agencies and private industry. The location of such responsibility, the scope of authority, and the administration are beyond the scope of this immediate study but should be studied further.

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS.

Productivity in the defense industry can and needs to be improved. Until the current disincentives to productivity investments are eliminated and contractors are properly motivated, little progress can be expected in improving productivity in defense contracts.

Declining productivity growth in defense industry can be traced to:

1. The overall economic climate in the US. The impact of the economy on investment is not, however, confined to the defense industry. The low levels of investment in non-defense as well as defense business is a manifestation of the negative effects of a poor economy.
2. The lack of a coordinated program or goal at the DOD level to improve productivity on defense contracts. There is no organization or individual with responsibility to insure that policies related to productivity are dealt with in a logical and consistent manner.
3. Ineffective use in DOD of a number of profit and cost related policies which attempt to stimulate capital investment, thereby making contractors more productive.

The productivity reward in Weighted Guidelines (WGL) has not been used primarily because of difficulty of measurement and tracking of productivity data. Although it appears that contractor productivity measurement would be difficult, it can be done. Business executives make capital investment decisions amounting to hundreds of billions of dollars annually, and productivity and return on investment calculations provide a basis for

those decisions. Currently, there are very few answers to the myriad of practical questions surrounding the implementation of a measurement and reward system in defense contracting, primarily due to lack of experience and attention by DOD. Generally, the data is accessible, and both government and contractor personnel have indicated a willingness to support such a system.

DOD can bring about improvements in contractor productivity by changing acquisition policy to eliminate some of these disincentives and establish motivators, but the impact of policy changes is constrained and tempered by the attitude and behavior of policy makers and labor outside the sphere of DOD control. Major, long-term productivity improvements will result only from a concomitant change in the attitude and behavior of political and business leaders and the American workforce.

The solution to the overall problem of declining productivity growth is not simple or immediate. In fact, part of America's productivity problem stems from short-run thinking in an area where investments typically bring mid- to long-run paybacks.

B. RECOMMENDATIONS.

When all is said and done, contractors will not improve their productivity when the risk is too great or the reward too small. Current DOD policies and practices place too great a risk on contractors because of program instability and provide too small a reward because of improperly applied profit and cost policies. The following recommendations are provided to establish an environment conducive to contractor productivity improvement:

1. Support should be given to legislative issues which would

contribute to a healthy economy and an atmosphere encouraging investment. Such issues include taxes, depreciation, enhanced multiyear contracting, rethinking of socioeconomic programs and review of the burdensome effect of overregulation by various levels of the Federal Government.

2. The use of special termination buy-back provisions should be expanded to contribute to a sense of stability in the acquisition process.

3. A strong policy statement endorsed at the Defense Undersecretary level should be made that WGL is expected to provide a fair and reasonable profit and that dispersion around the "average" percent of profit is expected and desired.

4. The productivity reward should be taken out of WGL and treated under an independent methodology. Such a methodology would include a measurement approach and a reward system for all types of productivity improvements. Since a measurement and reward system appears to be both feasible and practical and has the greatest probability of success as a motivator for improving productivity, an in-depth study should be undertaken to develop such a system. The appendix provides a brief outline of the issues to be addressed and the effort required to conduct the study and develop a system.

5. Responsibility for overall coordination and monitorship of productivity related policies and issues should be assigned at DOD level.

APPENDIX
STUDY OUTLINE FOR A DEFENSE
PRODUCTIVITY MEASUREMENT AND REWARD SYSTEM

I. BACKGROUND/PROBLEM.

Current motivators in defense acquisition profit policy are inadequate to bring about desired contractor productivity improvement. Compounding the inadequate motivation is the difficulty in measuring and tracking contractor's productivity gains. In order to motivate defense contractors to effect the desired improvements and associated cost savings, a relatively simple and effective system must be developed to measure and reward productivity gains.

II. STUDY OBJECTIVE.

The objective of this study is to develop and test a measurement and reward system designed to motivate contractors to improve their productivity on defense contracts.

III. STUDY SCOPE.

The development of a productivity measurement and reward system would constitute a major effort addressing such issues as specific definitions of contractor productivity, its measurement, a suitable reward mechanism, and Defense Acquisition Regulation coverage.

IV. STUDY APPROACH.

This study is a high-risk effort, but it has tremendous potential benefits. To reduce the risks and improve the chances of success, top-level management within DOD and the military services must wholeheartedly endorse and support this effort. To improve the chances for system

acceptance even more and establish credibility throughout the defense community, DOD and the defense contractors should be jointly involved in the system development. This will be readily achieved through a comprehensive survey endorsed by the Under Secretary of Defense for Research, Development and Acquisition, and distributed to the contractors through the various industry associations. Follow-up discussions will be held with those contractors giving the most favorable responses. A productivity measurement and reward system will then be designed, based primarily upon the survey results and contractor discussions. Once designed, the system will be tested at a pilot site(s), and, if warranted, be recommended for implementation throughout DOD.

V. RESOURCES REQUIRED.

The study described above is a major task requiring possibly three to five man-years of government effort over about a two year period and in excess of \$25,000 in travel funds. This estimate excludes any contractor expenses. Although the predominate portion of government effort is research, a considerable amount of management and coordination will be required at the DOD level. The Army Procurement Research Office can serve as the lead activity, with the Air Force Business Research Management Center and the Center for Naval Acquisition Research serving as focal points for support from their respective services.

INTERVIEWS CONDUCTED

The study team interviewed a number of people to obtain their views on defense productivity and what can be done to improve it. The interviewees are indicated below.

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